

## WHAT IS CLAIMED IS:

1. A method for motion estimation comprising:

saving motion vectors, MVs of a partial or an entire frame of at least one frame into a storage device for the best match macroblock searching of the current or the neighboring frames; and

calculating the motion vector, MV, of a macroblock within a frame by firstly searching a corresponding or the neighboring macroblocks of the current or at least one neighboring frame.

2. The method of claim 1, wherein using at least one motion vector of the current frame or a neighboring frame to encode the MVs of other macroblocks.

3. The method of claim 1, wherein estimating the MV of at least two macroblocks within a frame, and identifying the majority MV as the frame motion vector, FMV.

4. The method of claim 3, wherein applying the FMV to be the MV of a plurality of macroblocks or to be the initial point of the best match block searching for macroblocks within a current frame or the neighboring frames.

5. The method of claim 3, wherein the FMV is re-estimated when the number of macroblocks having different MV from the FMV reaches a predetermined value.

6. The method of claim 1, wherein the prioritized prediction modes for selecting the initial point of searching is specified by the previously saved MVs of the macroblocks within the present frame and the neighboring frames.

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7. The method of claim 1, wherein an adaptive threshold value is compared to the mean absolute difference, MAD of the targeted macroblock to determine whether to select or to give up the targeted macroblock which is under the best match macroblock searching.

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8. A method of motion estimation, further comprising applying the adaptively predetermined values of the MV, the MAD or the block differences to determine the sub-sampling ratio, or to decide a refiner or a coarser pixel resolution, or to decide the prediction mode of the initial point of searching or to decide whether to skip block, or to decide whether to early select or to early give up the current macroblock.

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9. The method of claim 8, wherein the sub-sampled pixels are applied to the calculations of the MAD, MV, FMV or block differences for the motion estimation.

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10. The method of claim 9, wherein a higher sub-sampling ratio is applied to macroblocks with lower value of MV or MAD,

11. The method of claim 9, wherein a lower sub-sampling ratio is applied to the motion estimation of macroblocks with the edge or close to the edge of an object or macroblock with wider variance range of pixel values while the higher sub-sampling ratio is applied to the motion estimation of macroblocks with smaller MV or narrower variance range of pixel values.

12. The method of claim 9, wherein the position of the pixel selection of the sub-sampling changes from frame to frame.

13. The method of claim 8, wherein a refiner pixel resolution is applied to the macroblocks having higher MV values or their neighboring macroblocks of the current frame or the neighboring frames.

14. The method of claim 8, wherein a coarser pixel resolution is applied to the macroblocks having lower MV values or their neighboring macroblocks of the current frame or the neighboring frames.

15. The method of claim 8, wherein in the case of the MV or block differences of a macroblock of previous frame is larger than a predetermine threshold value, the MADs of at least two positions of the current frame or the neighboring frame are calculated, and the position with the least MAD is selected as the initial point of the best match macroblock searching.

16. A method of motion estimation, further comprising:

the procedure of the best match block searching is applied to the blocks with the MV different from the frame motion vector, the FMV.

17. The method of claim 16, wherein the procedure of the best match  
5 block searching applies to the neighboring blocks of the block having MV different from the FMV.

18. The method of claim 16, wherein the majority macroblocks within a  
frame or a region have to go through the motion estimation procedure from time  
10 to time or when the accumulated amount of macroblock with movement different from the FMV reaches a predetermined value.

19. An apparatus for motion estimation comprising:  
a device determining the motion vector, MV of the current frame or at  
15 least one neighboring frame by comparing the targeted macroblock to the neighboring macroblocks; and  
a storage device that saves the MV of a partial or an entire frame of the current frame or at least one neighboring frame;

20. The apparatus of claim 19, wherein the FMV of the present  
20 macroblock is applied to be the MV of macroblocks within the current or neighboring frame, or the FMV is identified as the initial point of the best match macroblock searching

21. The apparatus of claim 19, wherein the previously saved MVs of at least one macroblock of the current or at least one neighboring frame are compared to the predetermined threshold values to determine the initial point of searching for other macroblocks.

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22. The apparatus of claim 21, wherein the majority MV of the corresponding or neighboring macroblocks of the current frame or at least one neighboring frame is selected as the initial point of searching for a plurality of macroblocks.

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23. The apparatus of claim 19, wherein a coarser pixel resolution or a higher sub-sampling ratio is applied to the motion estimation if the respective MV or MAD is smaller, while a finer pixel resolution or a lower sub-sampling ratio is applied to the motion estimation if the respective MV or MAD is larger.

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